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Y.-H. Zhang

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14. ABSTRACT
Semiconductor materials and devices have experienced very rapid development in the past more than half a century. However, there still remains a lack of closely lattice-matched materials and substrates suitable for the grand integration of various kinds of optoelectronic devices such as photovoltaic, IR light emitting and imaging devices on a single chip. We have recently proposed a new material platform: the 6.1 Å II-VI (HgMgZnCd)(SeTe) and III-V (AlGaIn)(PAsSb) semiconductor materials lattice-matched to GaSb and InAs substrates. These materials

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6.1 Å II-VI and III-V materials: A platform for photovoltaic and IR device applications

Yong-Hang Zhang

Director
Center for Photonics Innovation

Professor
School of Electrical, Computer and Energy Engineering
Arizona State University
Tempe, AZ 85287
Tel: 480-965-2562
Email: yhzhang@asu.edu
Web Pages: http://asumbe.eas.asu.edu/
http://photonics.asu.edu/

Abstract

Semiconductor materials and devices have experienced very rapid development in the past more than half a century. However, there still remains a lack of closely lattice-matched materials and substrates suitable for the grand integration of various kinds of optoelectronic devices such as photovoltaic, IR light emitting and imaging devices on a single chip. We have recently proposed a new material platform: the 6.1 Å II-VI (HgMgZnCd)(SeTe) and III-V (AlGaIn)(PAsSb) semiconductor materials lattice-matched to GaSb and InAs substrates [1-5]. These materials have direct bandgaps covering a very broad energy spectrum from far IR (~0 eV) to UV (~3.4 eV). This feature is not achievable by any other known lattice-matched semiconductors on any commercially available substrates. Such a unique material platform enables new light emitting devices, multi-junction solar cells, multi-color photodetectors and FPAs, and facilitates monolithic integration of various materials without misfit dislocations to ensure the best quality for device applications. This talk will focus on the latest progress of the MBE growth of the materials and their potential device applications to ultra-high efficiency solar cells and IR photodetectors.

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